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Myiasis caused by *Wohlfahrtia magnifica* (Schiner, 1862) in the Arabian camel (*Camelus dromedarius*) in the Peninsula of Sinai

HADANI (A.), BEN YAAKOV (B.), ROSEN (Sh.). Myiase causée par *Wohlfahrtia magnifica* (Schiner, 1862) chez le chameau d'Arabie (*Camelus dromedarius*) dans la péninsule du Sinai. *Revue Élev. Méd. vét. Pays trop.*, 1989, 42 (1) : 33-38.

L'apparition d'une myiase massive chez les dromadaires, causée par *Wohlfahrtia magnifica* (Schiner, 1862) dans la zone montagneuse méridionale de la péninsule de Sinai, est décrite. La wohlfahrtiose semble être intimement liée aux conditions climatiques et écologiques de la zone, particulièrement l'altitude, les précipitations atmosphériques, le pâturage, les rongeurs et les tiques. Les symptômes cliniques ressemblent à ceux décrits chez les moutons en Israël et chez les chameaux ailleurs. Un traitement à base de diazinon et de pyrèthre activé dans l'huile de pin s'est montré efficace. *Mots clés* : Dromadaire - *Camelus dromedarius* - Myiase - *Wohlfahrtia magnifica* - Influence du climat - Diazinon - Pyrèthre activé - Israël.

INTRODUCTION

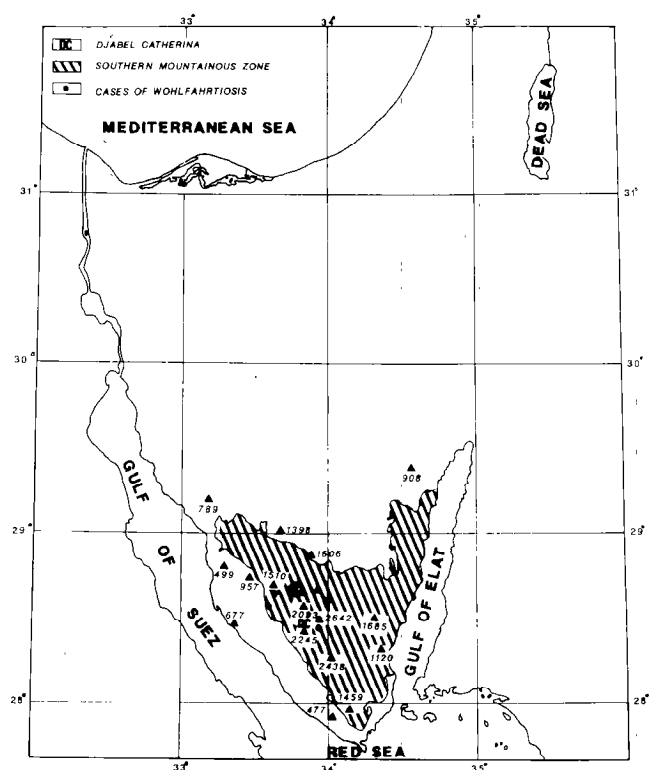
The Peninsula of Sinai (Map 1) is delimited between parallels 28 N and 31 N and longitudes 32 E and 35 E. It belongs to the belt of deserts encircling our planet. It is surrounded by sea and has been the scene of severe tectonic changes in the Tertiary and Pleistocene era, causing the « great elevation ». Its superficie is 61,000 km² and is divided into 2 major parts : the Southern Mountainous zone (SMZ) and the Northern plateau. The climate is essentially continental being characterized by extreme changes in temperature. The Arabian camel (*Camelus dromedarius*) is the main big domestic animal in Sinai being used by the local Bedouins for transport as well as providing other basic needs.

In summer 1976 the authors examined several camels in the SMZ showing severe lesions in the vulvar and perineal areas. The wounds were found to be heavily infested with larvae of *Wohlfahrtia magnifica*. The present communication describes wohlfahrtiosis in the Arabian camel in Sinai and attempts at its control.

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Map 1 : Distribution of clinical cases of wohlfahrtiosis in the Arabian camel (*Camelus dromedarius*) in the Southern Mountainous zone in the Peninsula of Sinai.

MATERIALS AND METHODS

The observations were carried out in the months of May-August, 1976, in the SMZ of Sinai. Information related to previous seasons has been obtained from the owners.

Topography, climate and phytogeographic conditions

The SMZ covers a superficie of 7,500 km² and belongs to the Arabo-Nubian massif composed mainly of elementary rocks reaching 2,000-2,600 meters in height. The extreme variation in temperature is described in table 1.

A. Hadani, B. Ben Yaakov, Sh. Rosen

TABLE I Multi-seasonal variations of temperature in the Southern Mountainous zone (SMZ) of Sinai ($^{\circ}\text{C}$)*.

Month	Monthly average	Daily maximum (Average)	Daily minimum (Average)	Absolute minimum and maximum
January	12	19	5	-15 (Minimum)
July	27	33	20	44 (Maximum)

* Kindly supplied by the Institute of Meteorology, Beit-Dagan, Israel.

Average annual rainfall in the Sinai ranges around 50 mm with 6-10 rainy days per year. The years '75 and '76 have been particularly rich in precipitation with a total rainfall of 112 and 147 mm, distributed over 5 and 8 months respectively (table II). Relative humidity is relatively stable ranging around 60 p. 100. Vegetation is bushy, covering 20-30 p. 100 of the superficie of the ravins (Waddis), including species of *Fagonia*, *Artemisia*, *Retama*, *Zilla* and *Hammada*.

Animals

Camel population in the SMZ is estimated at 2,500, all *Camelus dromedarius*, about half of which males. The average Bedouin owns 1-2 females maintained on permanent grazing and 1 male kept near the tent for immediate use. Clinical cases have been mainly observed in females. The females were found heavily infested with ticks particularly in the perineal area and posterior thighs. They roam freely across the hills feeding on the scarce pasture and particularly the *Retama* bushes where the *Hyalomma* ticks are concentrated. Male camels in fact can be infested with ticks but they are used permanently for transport and are consequently kept near the tents and well taken care of i.e. cleansed of the ticks. Numerous burrows of rodents were observed in the area and particularly so around the bushes of *Retama roetam*. *Meriones sp.* (*M. crassus*) is widespread in the area.

Clinical methods

The affected animals were detected from distance due to the peculiar horizontal posture of the tail and the soiling of the medial thighs (Photo 1). Fly larvae were extracted into 70° alcohol for later identification and the wounds were treated. Ticks were similarly collected from the animals. Most of the animals were checked 2-3 times during the 60 days following treatment.

Entomological methods

Adult sarcophagid flies were collected in the field and together with the larvae were identified using the usual criteria (5). Ticks were identified using Feldman-Muhsam's key for the genus *Hyalomma* (1).

Drugs

Carcide™ (*) was smeared copiously with a brush on the affected area (Photo 2). Infected wounds were treated with an aureomycin aerosol as well.

RESULTS

About 100 myiasis stricken camels were examined in the present study, all located at 800-900 m or more above sea level. No complaints were received from owners of camels at lower altitudes. Thus, descending the central massif, on either side, towards the sea, wohlfahrtiosis in camels tended to disappear.

According to the owners first cases of myiasis were detected towards the end of the calving season in March. The prevalence increased in May-June and decreased in July. Newly infested wounds were not detected in August when most of the affected animals showed cicatrized wounds. However, *W. magnifica* flies were still active in this period.

(*) Carcide™ (2 p. 100 diazinon, 0.05 p. 100 pyrethrum extract and 0.25 p. 100 piperonyl butoxide in pine oil, Dr. Meron, Chemical Industry, Haifa, Israel).

TABLE II Yearly records of rainfall in the Southern Mountainous zone of Sinai (Djebel Catherina, 1970-1979)*.

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Total rainfall (in mm)	0	24	19	63	82	112.1	147.1	91.9	58.7	63.4
No. of rainy months**	0	?	?	?	1	5	8	4	5	5

* Kindly supplied by the Institute of Meteorology, Beit-Dagan, Israel.

** Months with measurable precipitation.

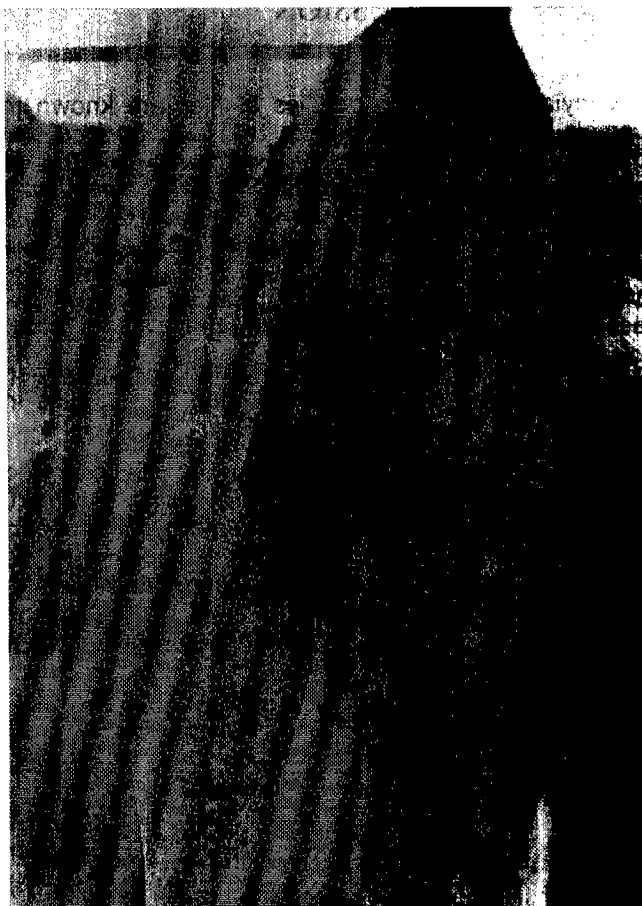


Photo 1 : Wohlfahrtiosis in the vulvar area in a camel. Note the soiling of the medial thighs.



Photo 2 : Treating vulvar wohlfahrtiosis in a camel with carcide.

Camels of both sexes and all ages were affected. Most of the affected animals were females with vulvo-vaginal lesions. Few males were found suffering from perineal myiasis. All the larvae extracted from the wounds were identified as *Wohlfahrtia magnifica* (*W.m.*) in various stages of development.

The animals were found heavily infested with *Hyalomma dromedarii* adults ticks, aggregated in the inguinal and perineal areas.

Prevalence of cases of wohlfahrtiosis in the area studied reached about 10 p. 100 of the camel population. Bedouins reported that in the previous year about 1 p. 100 of the animals were infested. The ulcerous wound has the characteristic features described previously in sheep (2), having a variable diameter (5-15 cm), irregular border and copious secretion (Photo 3). Larvae of varying size were observed in masses, wriggling in the inflamed, highly sensitive tissues. The hair and skin around the wounds didn't show tendency for granulation. Wounds free of larvae



Photo 3 : A characteristic vulvo-vaginal, ulcerous wound infested with larvae of *W. magnifica* in a camel.

A. Hadani, B. Ben Yaakov, Sh. Rosen

were observed in various stages of cicatrization. After complete healing the affected area was markedly deformed and fibrotic (Photo 4). Bedouins reported cases of myiasis also on the legs previously wounded. Parts of the body, covered densely with hair have not been affected. Spontaneous healing of the wounds lasted 3-4 weeks, following disappearance of the larvae, decrease and cessation of the discharge. Mortality due to wohlfahrtiosis has not be recorded.

The parasitized wounds were dressed by the Bedouins with various plant water extracts and powders. Wounds were first cleaned with a water extract of *Retama roetam* and then treated with a powder prepared from *Hamada salicornica*, *Hyoscyamus desertorum* and *Peganum harmala*. In some cases the wounds were treated with tobacco leaves or naphtalene powder. The carcide was distributed to the owners in tins and applied with a brush 3-4 times with 3-4 day intervals.

Following the first application the larvae disappeared and within 1-2 weeks complete recovery was noted. The affected area remained distorted and fibrotic.

DISCUSSION

Six myiasis producing species of flies are known in camels, 5 of which belong to the *Calliphoridae* and one to the *Oestridae* (4). *W.m.* is the most important myiasis causing fly in camels. The fly occurs in the Mediterranean basin, southern Russia, Turkey, Iran and the Far East. Wohlfahrtiosis has been reported in sheep and goats in the USSR, North Africa and the Middle East (8). Wohlfahrtian myiasis in camels has been thoroughly described in Mongolia (7).

Sporadic cases of myiasis, caused by *W.m.* have been detected in sheep and calves in the Lower Galille in Israel (6).

Massive occurrence of the disease has been reported in sheep in the Golan Heights in the years 1969-1970 (2). *W.m.* is widely distributed in Israel but the occurrence of wohlfahrtiosis in animals appears to be intimately associated with local climatic and ecological conditions. Bedouins in the SMZ of Sinai claim that sporadic cases of myiasis actually occurred in

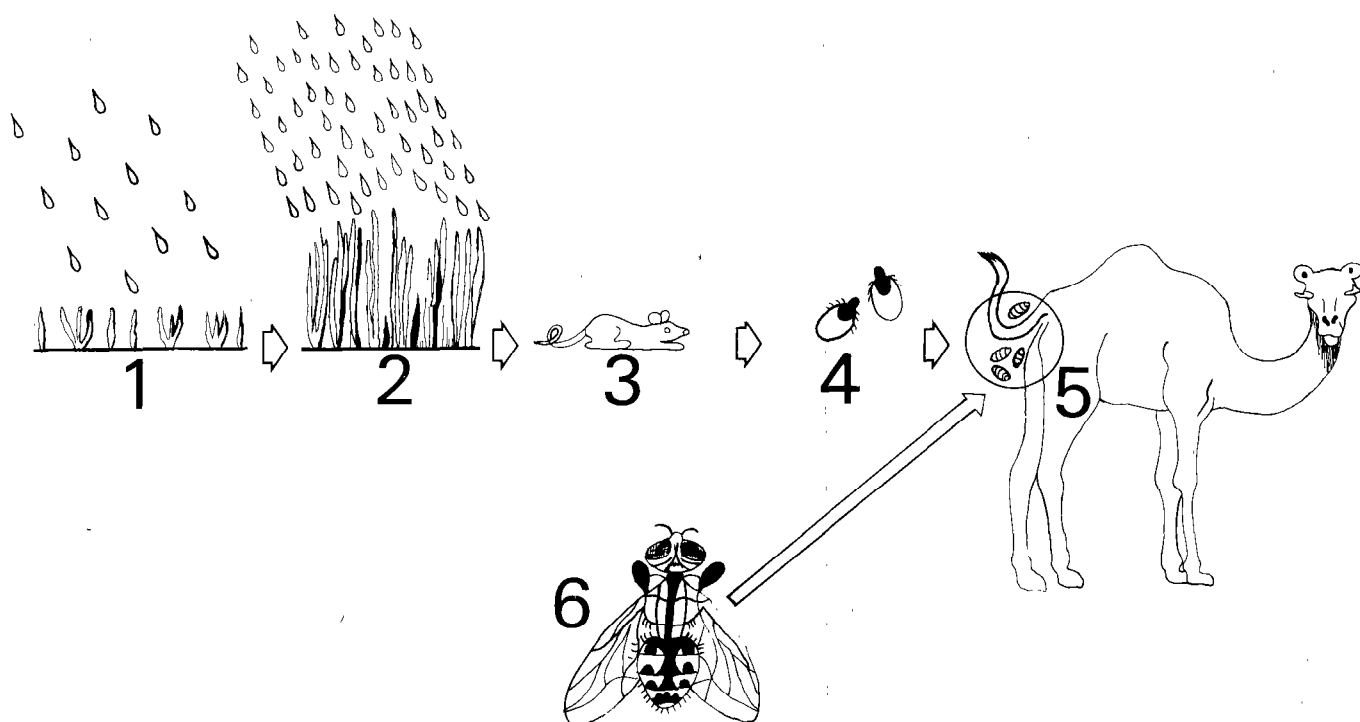


Fig. 1 : Epizootiology of wohlfahrtiosis (*Wohlfahrtia magnifica*) in the Southern Mountainous zone (SMZ) of Sinai (1975-1976).

1. Low rainfall (50-60 mm/year) with poor vegetation in the years 1970-1974 ;

2. High rainfall (110-150 mm/year) with rich, green pasture in spring in the years 1975-1976 ;

3. Intensive breeding of rodents, particularly *Meriones* spp. which

serve as a host for *Hyalomma dromedarii* ticks ;

4. Intensive multiplication of *Hyalomma dromedarii* ticks ;

5. Camels heavily infested with *H. dromedarii* adult ticks ;

6. *W. magnifica* depositing larvae in tick wounds in the perineal area of the camels.



Photo 4 : A wohlfahrtian scar, causing deformation of the vulvar and perineal area in a camel.

camels in previous years. The years 1975-1976 were particularly rich in precipitation. As can be seen from table II, these years had 112 and 147 mm rainfall in 5 and 8 rainy months respectively.

Some of the rains were late, occurring in the months of March-April, well after the typical cold wave in March (« Bard El Adjoz »), thus ensuring lush, green pasture in the spring. Climatic conditions and rich vegetation have been particularly favourable to the multiplication of rodents, mainly *Meriones spp.* These animals have been shown (2) to serve as efficient hosts for the pre-imaginal stages of *H. dromedarii* as well as other 3 host ticks. Burrows of the gerbils were scattered around the *R. roetam* bushes (Photo 5) which were frequented by the camels. *W.m.* has been reported to be attracted to tiny lesions often caused by the tick bites (4, 7). The epizootiology of wohlfahrtiosis in camels in the Sinai seems to have evolved as described in figure 1.

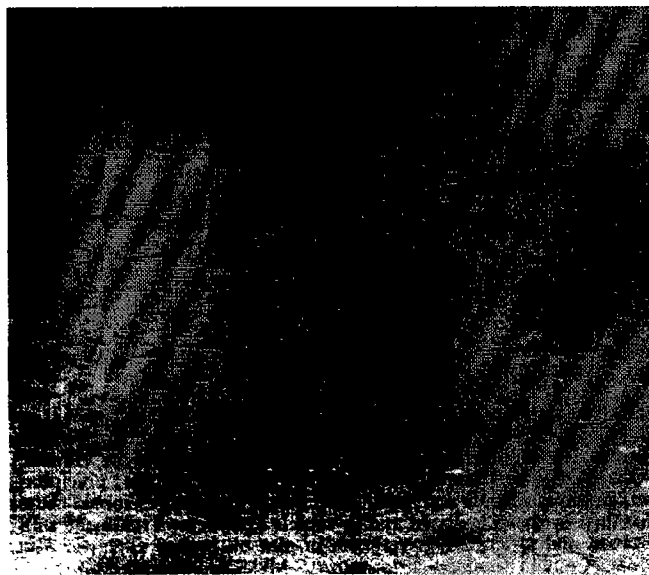


Photo 5 : Bushes of *Retama roetam*, an important source of forage for camels in the Peninsula of Sinai. The vicinity of the bushes is disseminated with burrows of *Meriones crassus*.

The usual low annual precipitation (50-60 mm) in the SMZ and the late March freezing wave severely affect the pasture in spring and are prejudicial to the rodent and tick populations. Consequently in the normally dry years only sporadic cases of wohlfahrtian myiasis occur in camels. The present outbreak is probably related to the exceptionally high precipitation which started the chain of events as described in figure 1.

In our study camels grazing at 900 m or more above sea level were mostly affected. Similar findings were reported in camels in the Popular Republic of Mongolia (7), where the climatic conditions are similar to those of the SMZ in Sinai. Calving in March seems to predispose the animals to the myiasis. The gravid female flies are attracted to the lochial fluids and the damaged tissues. First cases of myiasis were reported in March, reaching a peak in May-July. Prevalence decreased in August though *W.m.* flies could still be found. Bedouins claim that late in summer female flies are « empty » and do not deposit larvae. In Mongolia cases of wohlfahrtian myiasis in camels have been reported between April and October (7). Similar findings were registered in sheep in the Golan Heights (2). About 10 p. 100 of the camels in the exposed herds were found infested with *W.m.* larvae. Similar prevalence of the disease was reported elsewhere.

Clinically the lesions are similar to those described in sheep which were struck by the myiasis in the wool free perineal area, the pinnas and the legs. Camels showed lesions in the sparsely hair covered hind parts. After healing the perineal and vulvar areas were

A. Hadani, B. Ben Yaakov, Sh. Rosen

markedly deformed and fibrotic with possible complications in future calvings. Similar clinical evolution was noted in the affected sheep (2). Treatment with 2 p.100 diazinon and 0.05 p.100 synergized pyrethrum proved effective. Pine oil seemed to repel the gravid female flies. Infected wounds should be treated with antibiotics as well.

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Massive myiasis caused by *Wohlfahrtia magnifica* (Schiner, 1862) in camels in the Southern Mountainous zone of the Peninsula of Sinai is described. Wohlfahrtiosis seemed intimately related to the climatic and ecological conditions of the area, particularly altitude, precipitation, pasture, rodents and ticks. The clinical features resembled those described in sheep in Israel and in camels elsewhere. Treatment with diazinon and synergized pyrethrum in pine oil proved effective. *Key words*: Camel - *Camelus dromedarius* - Myiasis - *Wohlfahrtia magnifica* - Climate influence - Diazinon - Synergized pyrethrum - Israel.

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HADANI (A.), BEN YAAKOV (B.), ROSEN (Sh.). Miasis provocada por *Wohlfahrtia magnifica* (Schiner, 1862) en el dromedario de Arabia (*Camelus dromedarius*) en la Peninsula de Sinai. *Revue Élev. Méd. vét. Pays trop.*, 1989, 42 (1): 33-38.

Se describe una miasis masiva provocada por *Wohlfahrtia magnifica* (Schiner 1862) en dromedarios, en la zona montañosa del sur de la Peninsula de Sinai. La wohlfahrtiosis parece intimamente relacionada a las condiciones climáticas y ecológicas del área, especialmente a la altitud, las lluvias, los pastos, los roedores y las garrapatas. Las características clinicas son semejantes a las que ya fueron descritas en ovinos en Israel, y en dromedarios de otras regiones. El tratamiento con diazinon y piretro asociado a sinergistas en aceite de pino, demostro su eficacia. *Palabras claves*: Dromedario - *Camelus dromedarius* - Miasis - *Wohlfahrtia magnifica* - Influencia del clima - Diazinon - Piretro y sinergistas - Israel.

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